



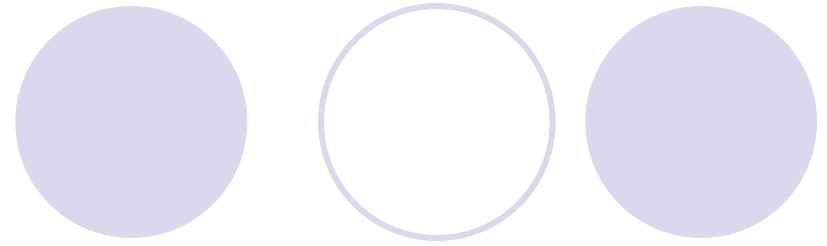
Anatomy & Physiology

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Acknowledgements



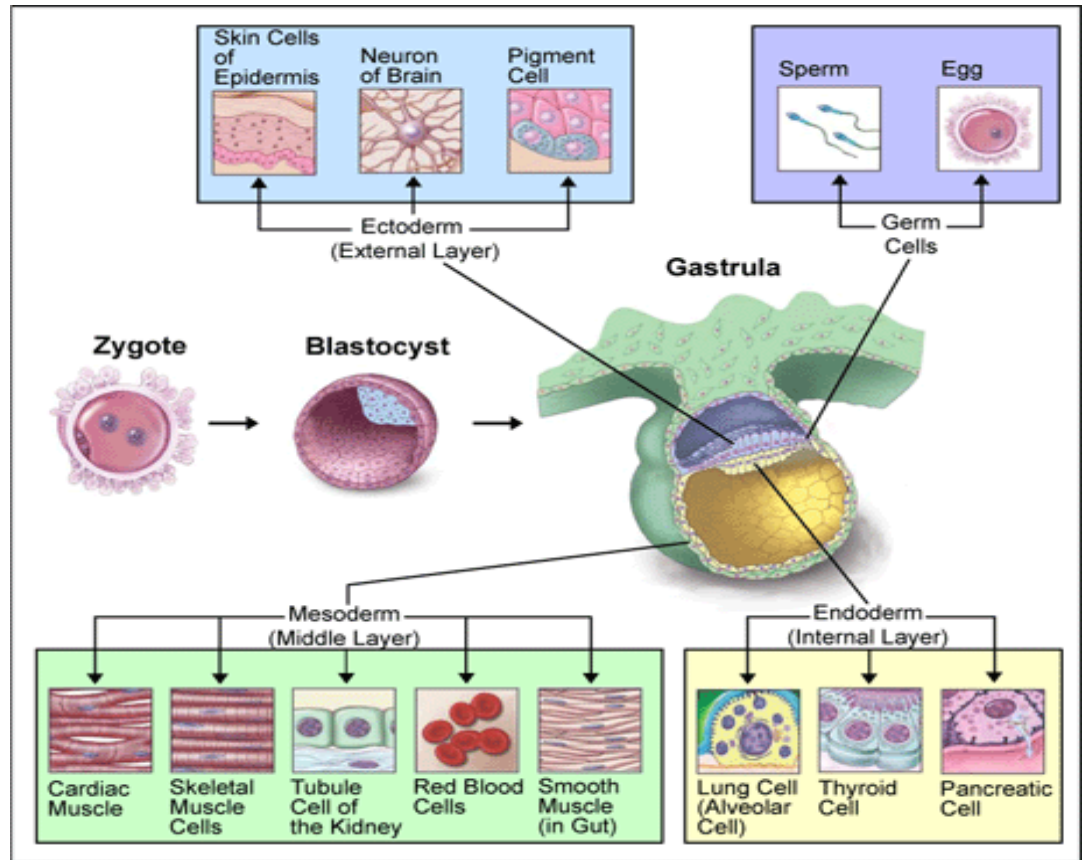
In the Beginning



- Embryonic Development:
 - Zygote
- Implantation into Endometrium
 - Embryonic/Primitive germ layers develop:
 - Endoderm
 - Mesoderm
 - Ectoderm
 - From these layers the four major tissues develop into organs and systems

In the Beginning

- Endoderm:
 - Epithelium
- Mesoderm:
 - Epithelium
 - Muscle
 - Connective
- Ectoderm:
 - Epithelium
 - Nervous



The Basic Tissues



- Epithelial Tissue:

- Cells closely opposed, with a basal lamina (basement membrane) at their base.
- Function: line (cover) body cavities and give rise to glandular secretions.
- Primary cell types: squamous, columnar, cuboidal

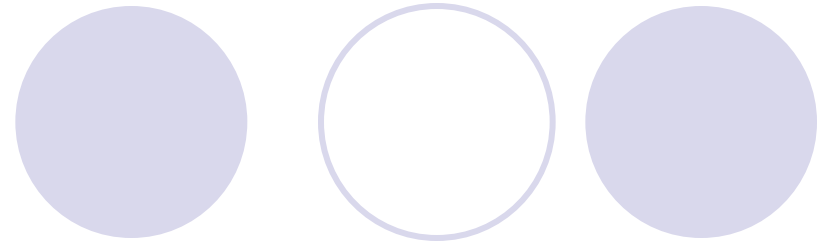
The Basic Tissues



- **Connective Tissue**

- Function: Support & Protect Body
- Characterization: Presence of few cells, imbedded in extracellular matrix composed of protein fibers, ground substance, and tissue fluid
- Primary types: fibers of collagen, elastic, and reticular

The Basic Tissues



- Muscle Tissue

- Function: Movement of tissues & systems
- Primary types: skeletal, cardiac (myocardium), smooth

- Nervous Tissue

- Function: Transmission of nerve impulses
- Primary types: neurons & glial cells

Membranes



- Thin sheets of tissue that cover the body, line body cavities, and cover organs
- Connective tissue membranes
 - Synovial: line cavities of movable joints
 - Knee, elbow, shoulder
 - Meninges: covers brain and spinal cord

Membranes

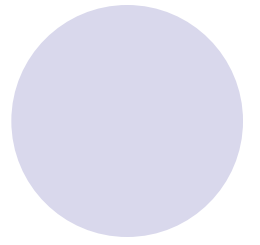
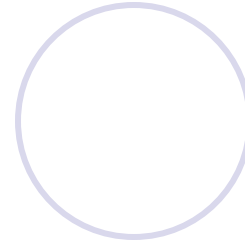
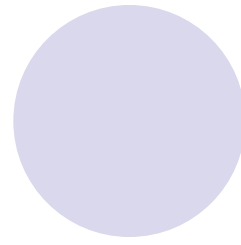
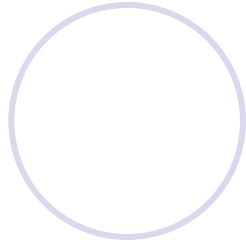
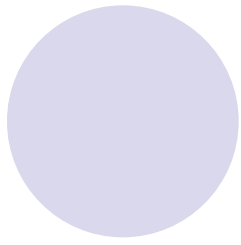
- Epithelial membranes

- Mucous: line body cavities that open to the outside

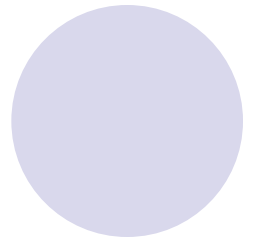
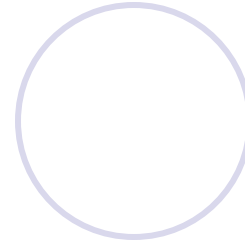
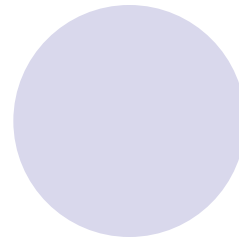
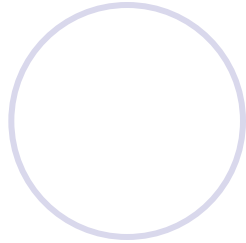
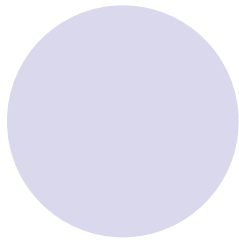
- Digestive tract, respiratory tract, reproductive tract

- Serous: line body cavities that do not open to the outside, covered by thin layer of serous fluid

- Pleura



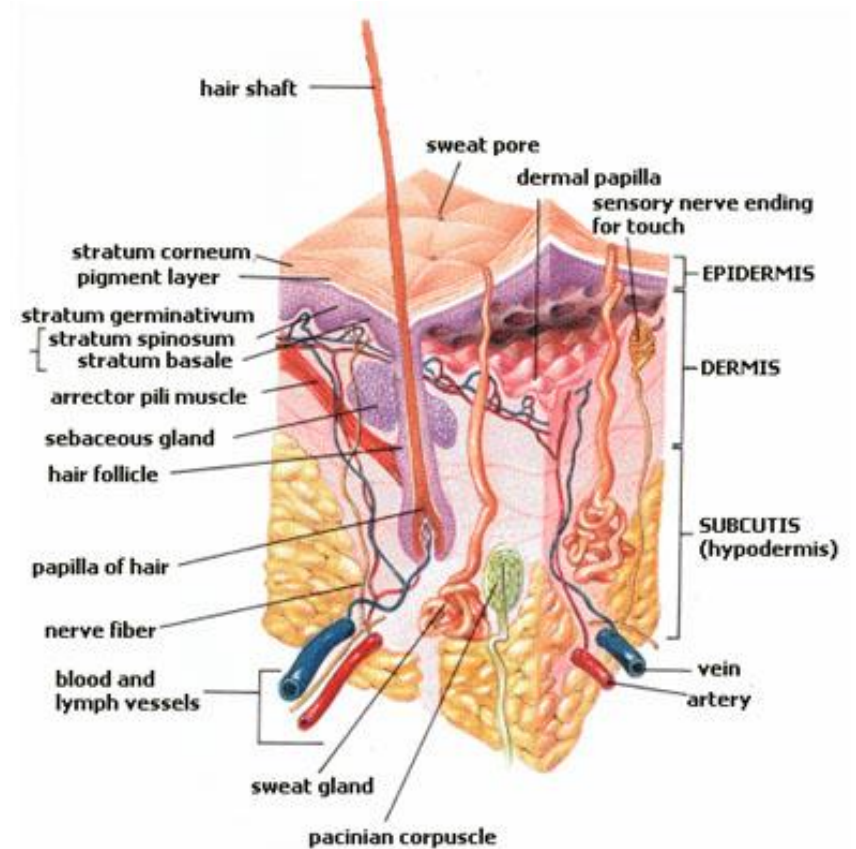
Systems of the Body



Integumentary System

Skin

- Covers entire surface of body
- Consists of 3 layers
 - Epidermis: thin outer layer
 - Dermis: thick underlying layer
 - Hypodermis: fatty layer



Epidermis



- Consists of 5 sub layers
- Basal cell layer
 - Innermost layer of epidermis
 - Contains melanocytes that produce skin coloring
 - Melanoma develops when melanocytes undergo malignant transformation

Epidermis



- Squamous cell layer
 - Resides above basal layer
 - Also called stratum spinosum
 - Contains keratinocytes, squamous cells that produce keratin
 - Protein found in skin, hair, & nails
 - Thickest part of epidermis

Epidermis



- Stratum Granulosum & Stratum Lucidum
 - Two thin layers that contains keratinocytes from squamous cell layer
- Stratum corneum
 - Outermost layer
 - Continuously sloughs off dead keratinocytes

Dermis

A diagram showing five circles in a row. The first, third, and fifth circles are filled with a light purple color. The second and fourth circles are empty, with only a light purple outline. The word 'Dermis' is written in black text to the left of the first circle.

- Thickest of the 3 layers
- Contains 90% of thickness of the skin
- Stores much of the body's supply of water
- Papillary layer
 - Regulates body temperature
 - Supplies epidermis w/ nutrient-filled blood
- Reticular layer
 - Provides structure & elasticity
 - Supports components of skin

Hypodermis



- Fatty layer also known as subcutis or subcutaneous
- It's a network of fat & collagen
- Acts as a shock-absorber for body
- Protects the inner organs

Malignancies of the skin

● Melanoma

- Occurs in the melanocytes
- May spread through the blood or lymph system to other organs and bones
- Accounts for 4% of cancers in the U.S.
- Most common in young adults (20-30 yrs old)



Malignancies



- Melanoma other than skin
 - Known as “hidden melanomas”
 - Tend to develop in four areas:
 - Nail bed
 - Mucosal Tissue
 - Scalp
 - Eye

Malignancies of Skin

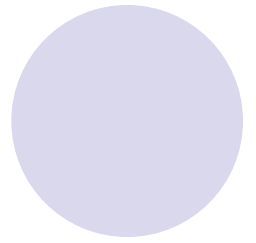
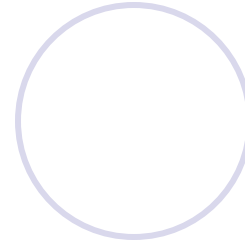
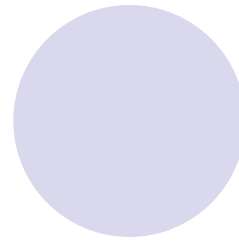
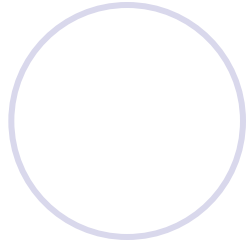
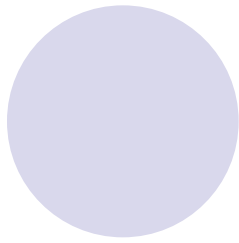


● Basal Cell Carcinoma

- Most common form
- Almost never spread to other body parts
- Usually begins as a small, dome-shaped bump and is often covered by small, superficial blood vessels
- Some basal cell carcinomas contain melanin pigment making them look dark rather than shiny

● Squamous Cell Carcinoma

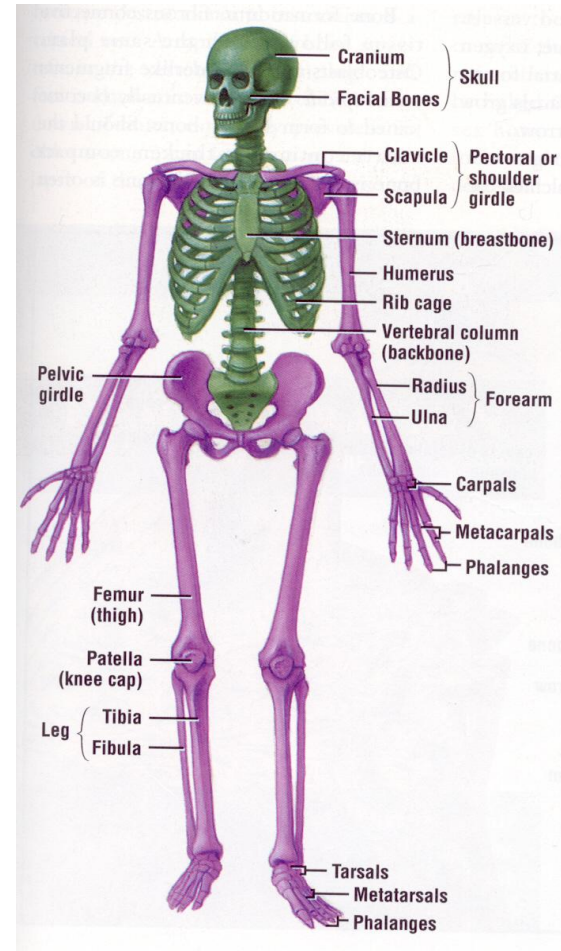
- Occurs one-quarter as often as Basal Cell Carcinoma
- Can metastasize to other parts of the body
- Can develop from precancerous spots, called actinic or solar keratoses



Skeletal System

Skeletal System

- Includes bones, cartilage, ligaments, tendons
- Skeleton protects soft body parts
- Works with muscles to produce movement



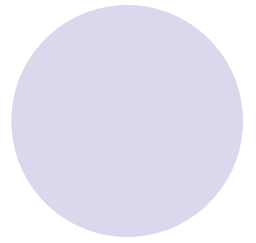
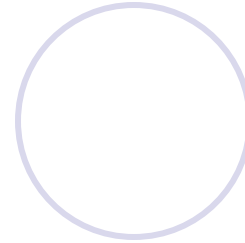
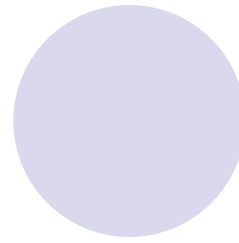
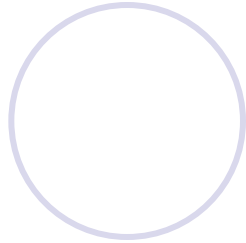
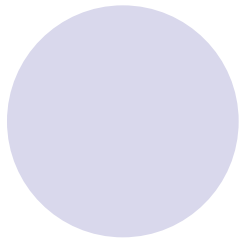
Bones



- Framework of the body
- Two types of tissues
 - Compact: contains osteocytes, bone cells
 - Spongy: lighter & less dense
- Classification
 - Long bones
 - Short bones
 - Flat bones
 - Irregular bones

Malignancies of Skeletal System

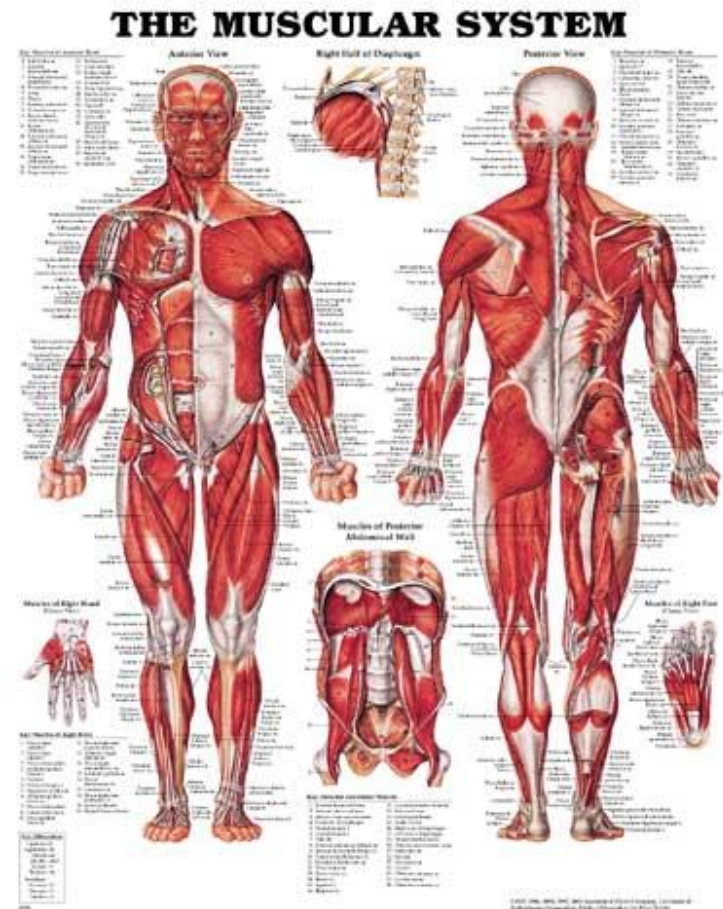
- Osteosarcoma: malignancy of bone or cartilage most often in long bones
- Chondrosarcoma:
 - Peripheral affects flat bones
 - Central occurs most often in femur, tibia, or humerus



Muscular System

Muscular System

- Almost all body movement is a result of muscle contraction
- Each muscle contains skeletal muscle tissue, connective tissue, nerve tissue, & vascular tissue



Types of Muscles

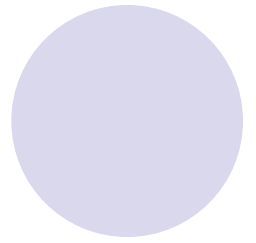
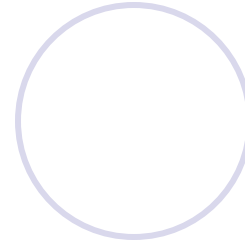
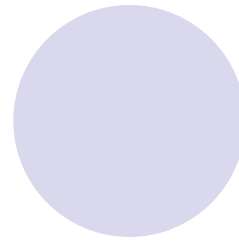
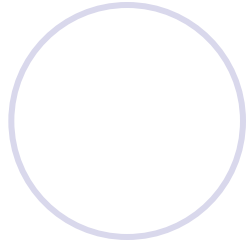
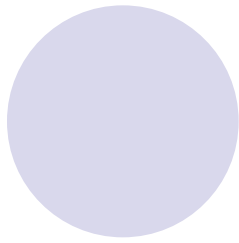


- Skeletal muscles: responsible for skeletal movements, attached to bone
- Smooth muscles: controlled by autonomic nervous systems, found in walls of hollow organs such as uterus & bladder
- Cardiac muscle: controlled by autonomic nervous system

Malignancies of Muscle



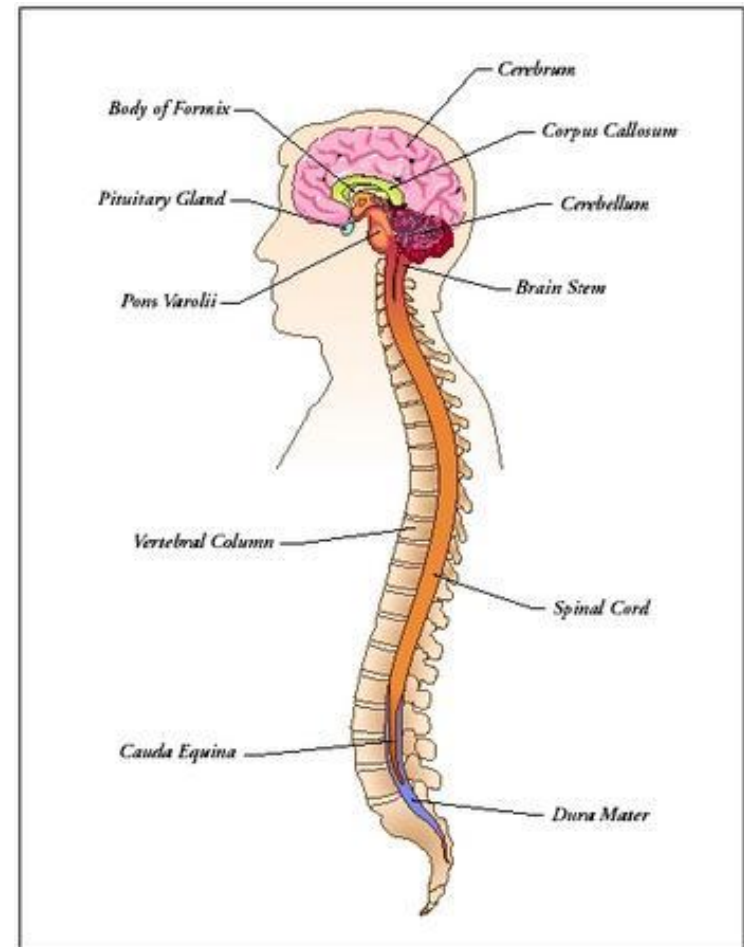
- Leiomyosarcoma: malignancy of smooth muscle
- Rhabdomyosarcoma: malignancy of striated muscle
- Angiomyosarcoma: malignancy of blood vessels & muscular tissue



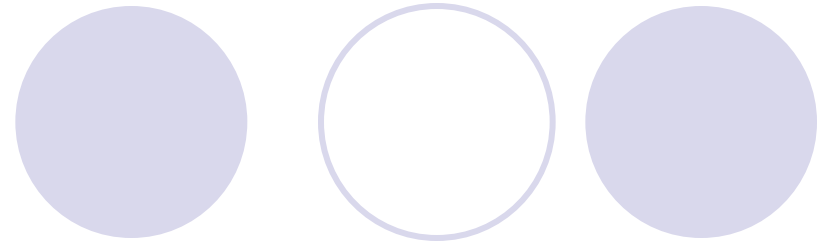
Nervous System

Nervous System

- It is the body's control, regulatory, and communication system
- Includes
 - Brain
 - Spinal cord
 - Nerves
 - Ganglia



Nervous System



- Two cell types
 - Neurons: nerve cells that conduct nerve impulses; no mitosis so they cannot be replaced if destroyed
 - Neuroglia: cells that support, nourish, and protect neurons; are capable of mitosis

Nervous System

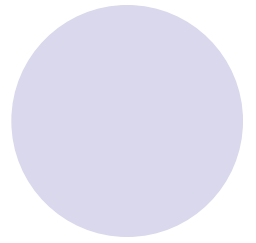
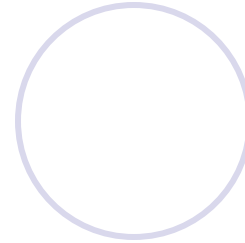
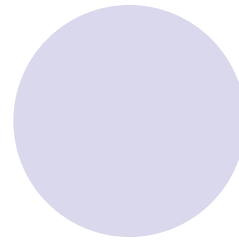
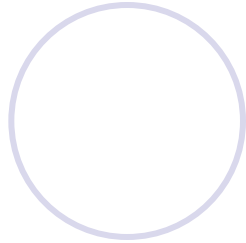
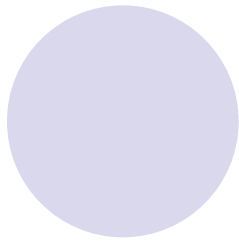


- Central Nervous System (CNS)
 - Brain
 - Spinal cord
- Peripheral Nervous System (PNS)
 - Afferent: sensory
 - Efferent: motor
 - Somatic: motor impulses to skeletal muscles
 - Autonomic: motor impulses to cardiac & smooth muscles & glandular epithelium



Nervous System Tumors

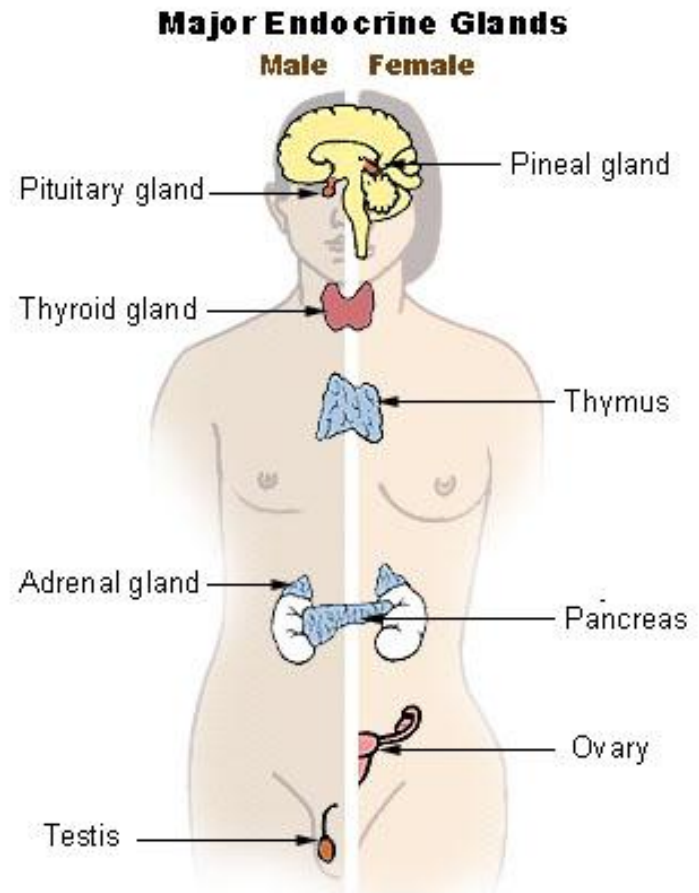
- Astrocytoma: malignancy arising from glial cells
- Glioblastoma: malignancy derived from embryonal astrocytes
- Meningioma: tumor arising in meninges
- Schwannoma: benign tumor of cranial nerve



Endocrine System

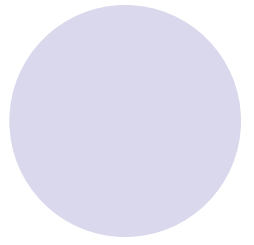
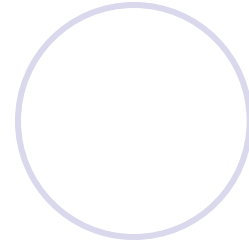
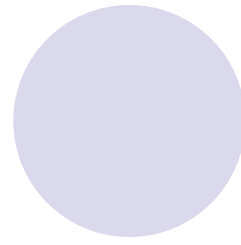
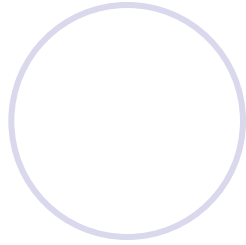
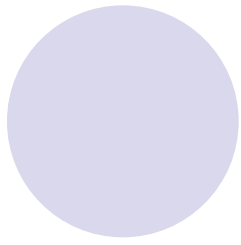
Endocrine System

- Regulates body activities
- Exocrine glands
 - Sweat
 - Sebaceous
 - Mammary glands
- Endocrine glands
 - Pituitary
 - Thyroid
 - Adrenals



Endocrine System Malignancies

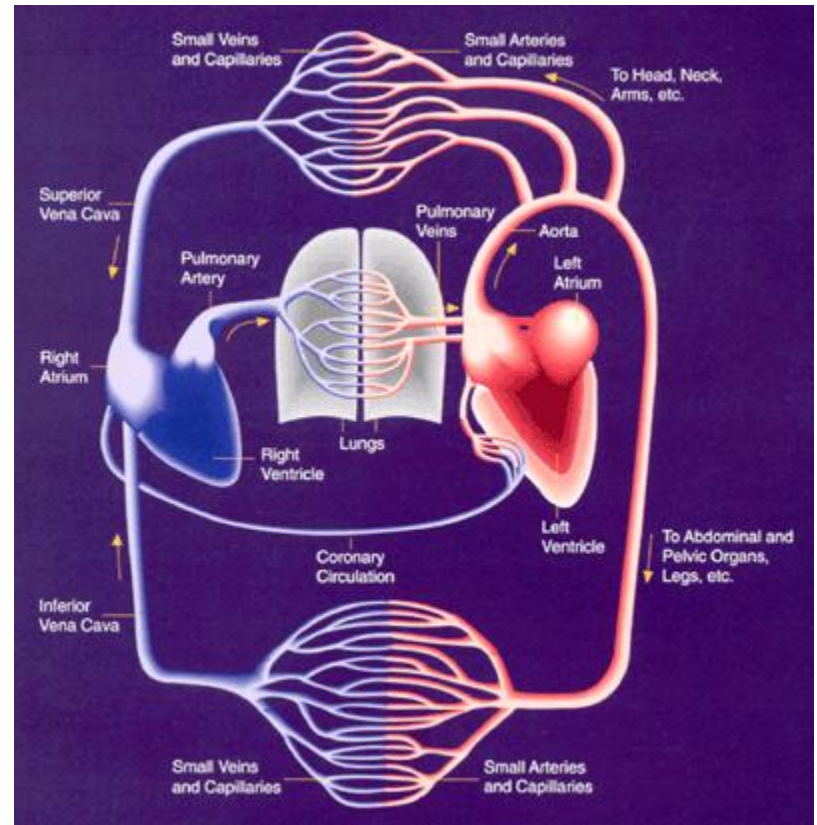
- Papillary adenocarcinoma: most common thyroid cancer
- Follicular adenocarcinoma: also common in thyroid
- Neuroblastoma: arises in medulla of adrenal gland
- Pituitary adenoma: benign tumor of the pituitary gland



Cardiovascular System

Cardiovascular System

- Circulates blood through the body
- Includes
 - Heart
 - Arteries
 - Veins
 - Capillaries



Cardiovascular System



- Heart: muscle that provides the force to circulate blood
- Arteries: carry blood away from heart
- Veins: carry blood toward heart
- Capillaries: connection between the arteries and veins

Cardiovascular System



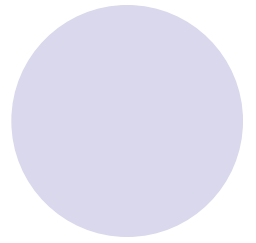
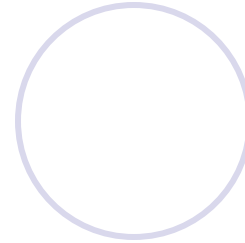
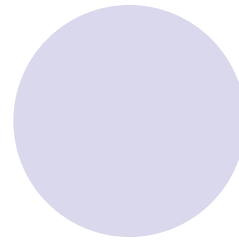
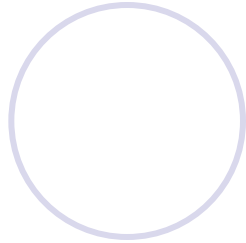
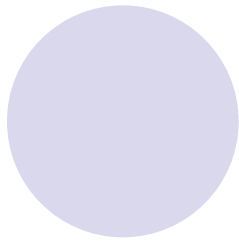
- Blood

- Erythrocytes: red blood cells (RBC) transport oxygen
- Hemoglobin: oxygen-carrying component of blood
- Leukocytes: white blood cells (WBC) defend against invading organisms
- Platelets: thrombocytes that form in bone marrow



Cardiovascular Malignancies

- Leukemia: malignancy of blood; uncontrolled proliferation of white blood cells
- Polycythemia vera: malignancy of blood that lowers the red blood cell count

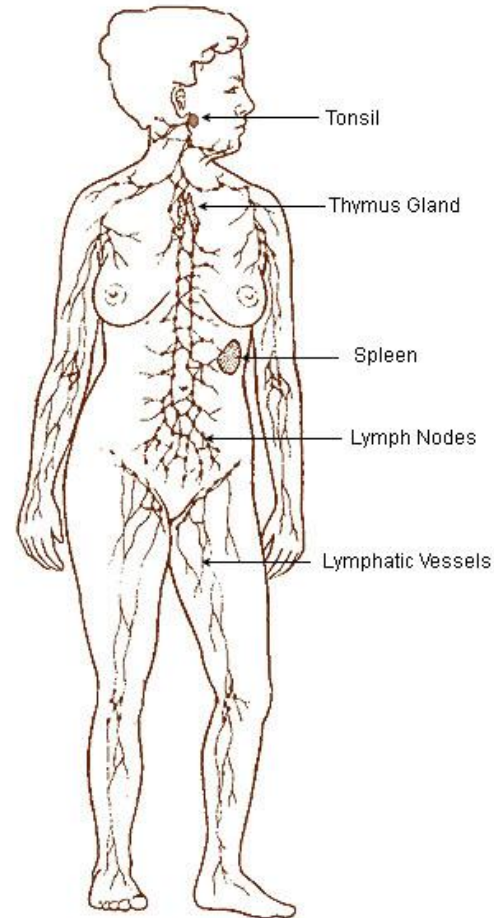


Lymphatic System

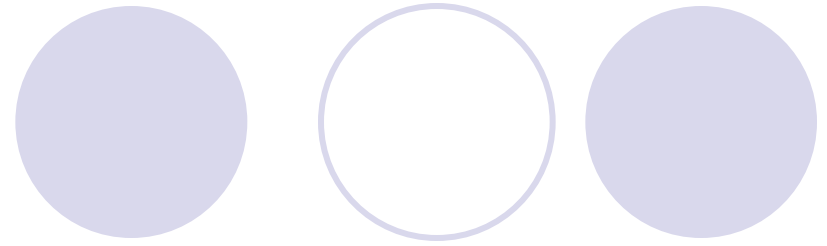
Lymphatic System

- Major components:

- Lymphatic vessels
- Lymph
- Lymph nodes
- Some other lymph organs



Lymphatic System



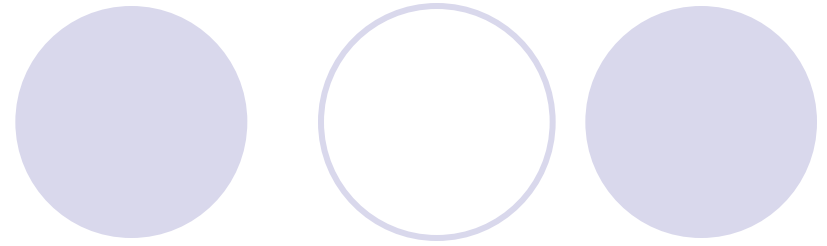
- Lymph

- Interstitial fluid similar to and derived from plasma
- Maintains blood volume & pressure
- Drains from organs to regional lymph nodes and then to distant lymph nodes

- Lymphatic vessels

- Carry fluids away from tissues
- From lymphatic trunks
 - R lymphatic duct drains RUQ body
 - Thoracic duct drains the rest of body

Lymphatic System



- Lymphatic organs

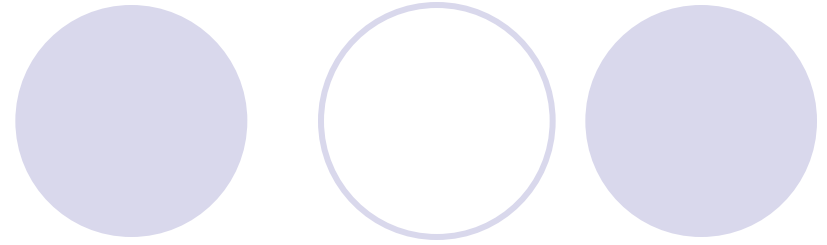
- Lymph nodes

- Armpit: axillary nodes
 - Neck: cervical nodes
 - Groin: inguinal nodes
 - Intestine: Para-aortic or Retroperitoneal nodes

- Tonsils

- Defend against disease
 - Pharyngeal tonsils (adenoids)
 - Palatine tonsils
 - Lingual tonsils

Lymphatic System



- Lymphatic Organs

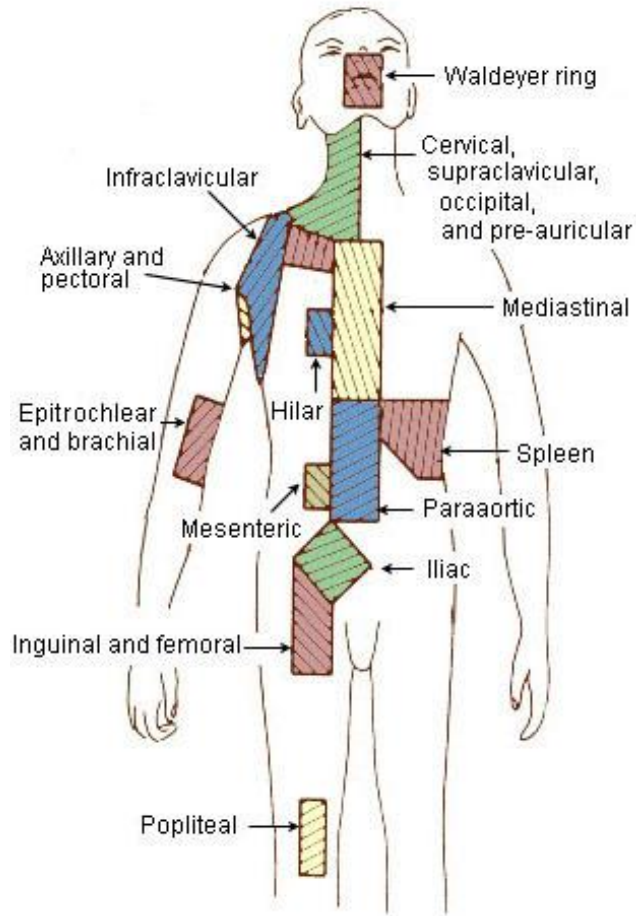
- Spleen

- Filters blood
 - Located in upper abdominal cavity posterior to the stomach & beneath diaphragm

- Thymus

- Processes T lymphocytes (T cells)
 - Located anterior to ascending aorta and posterior to sternum

Lymphatic System



- **Lymph Node above diaphragm:**

- Waldeyer ring
- Tonsils
- Cervical
- Infraclavicular
- Supraclavicular
- Mediastinal
- Hilar
- Epitrochlear

- **Lymph Node below diaphragm:**

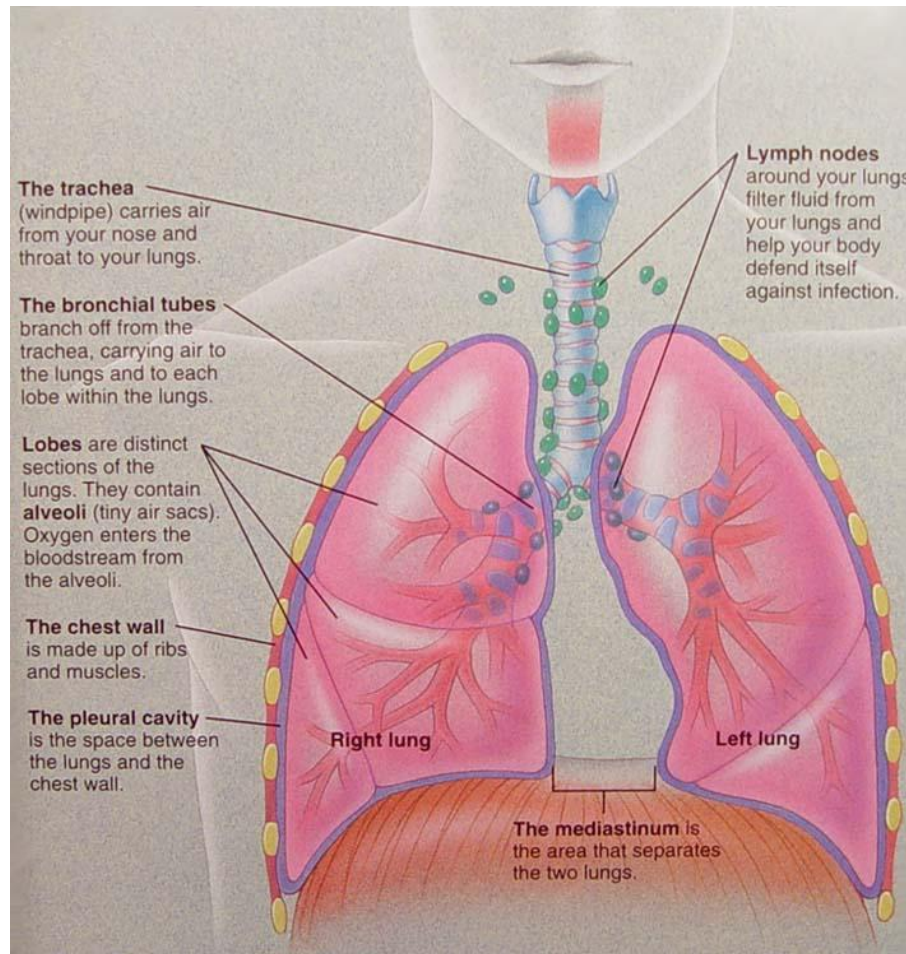
- Upper abdomen
- Lower abdomen
- Iliac
- Inguinal
- Femoral
- Popliteal
- Spleen

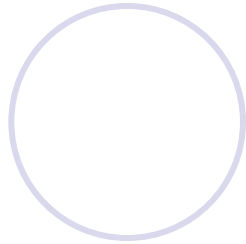
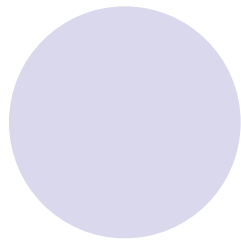


Lymphoma

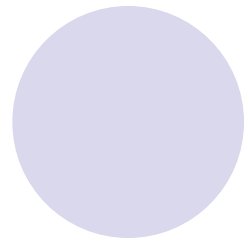
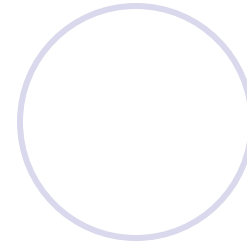
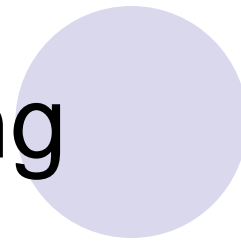
- Two main groups:
 - Hodgkin lymphoma (Hodgkin disease)
 - Non-Hodgkin lymphoma
- Hodgkin lymphoma:
 - Single lymph node
 - Group lymph nodes
 - Other lymphatic system parts
- Non-Hodgkin lymphoma:
 - Single lymph node
 - Group lymph nodes
 - Another organ

Respiratory System





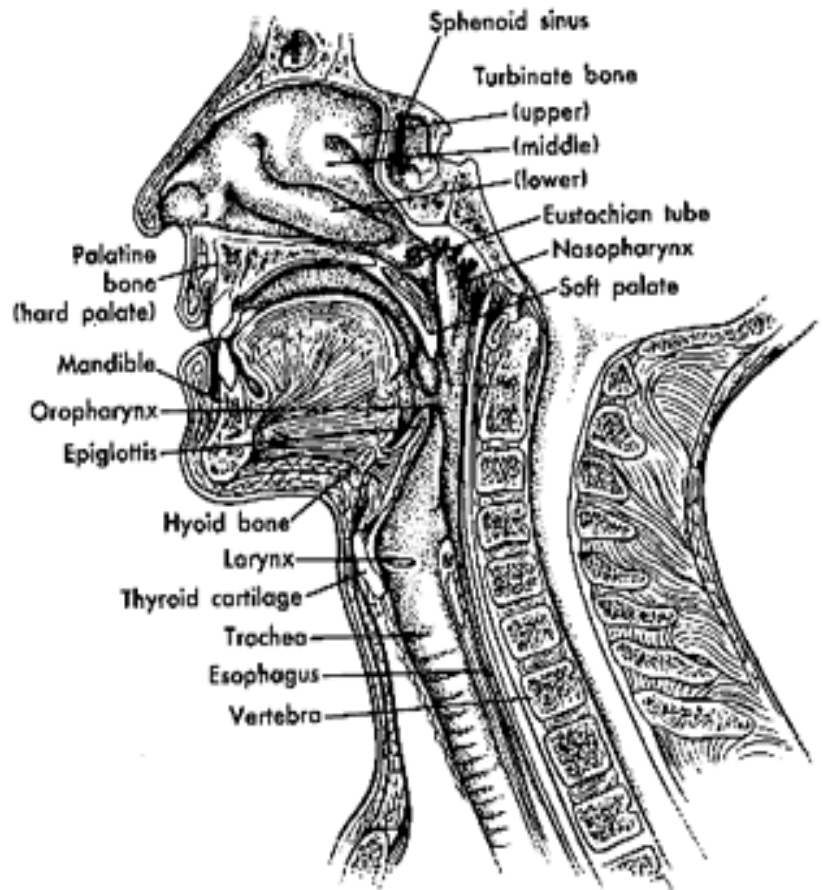
Lung



- Composition of the Lungs:
 - Soft, spongy, cone-shaped organs
 - Right lung is larger of the two and is divided into 3 lobes
 - Left lung is divided into 2 lobes
 - Each lung has four surfaces
 - Enclosed in a double wall sac-pleura
 - Surface adhering to the lungs is the visceral pleura, the outside layer is the parietal pleura

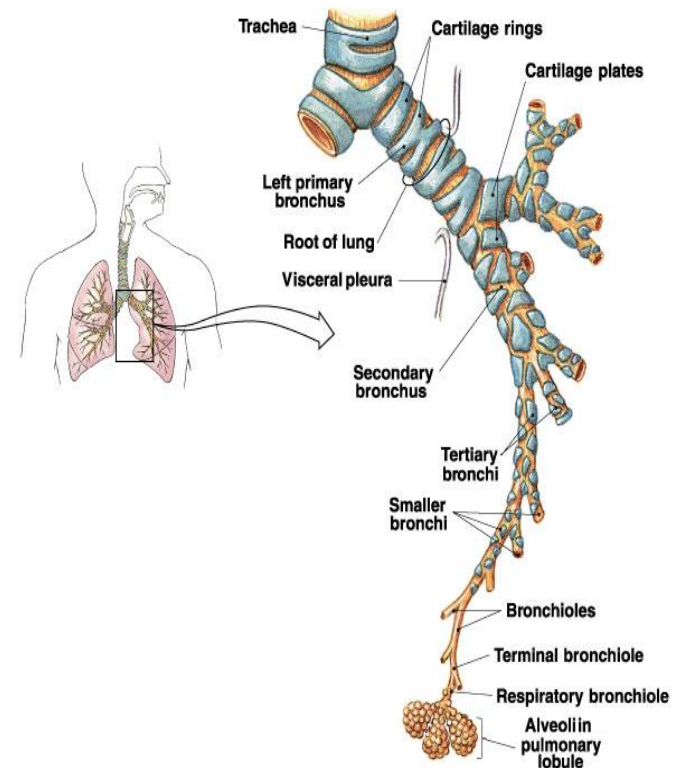
Upper Respiratory Tract

- Nose: entry & exit point for gases
- Pharynx: throat
- Larynx: air crosses voice box and produces sound



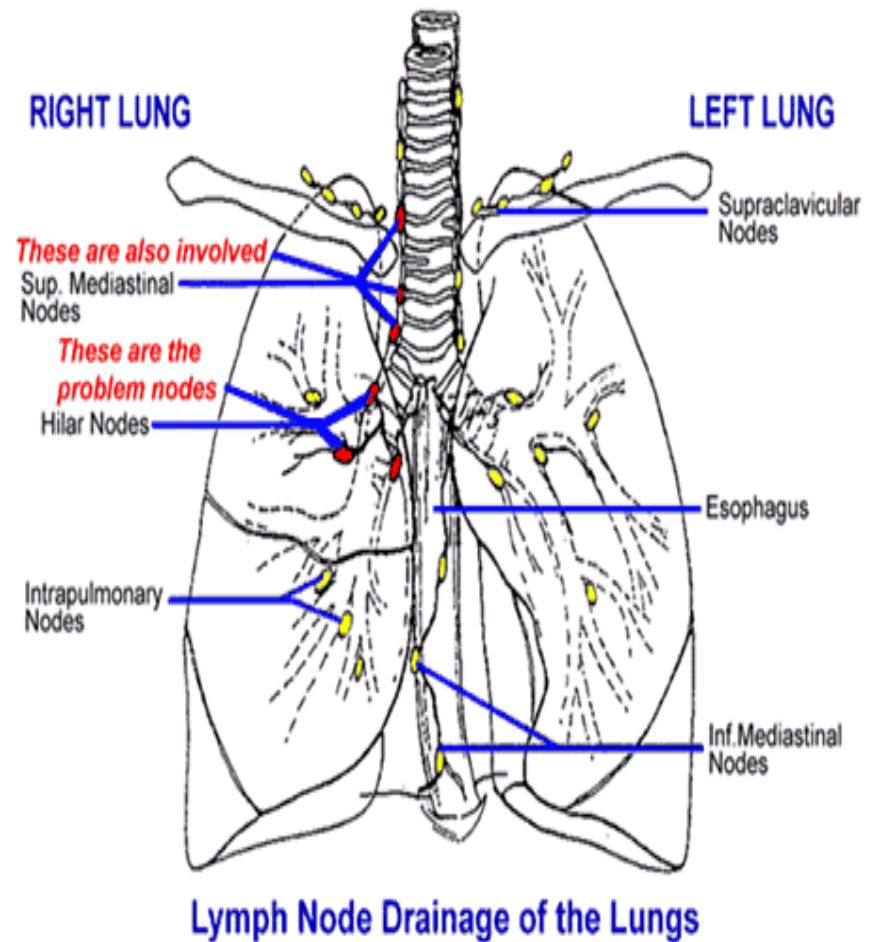
Lower Respiratory Tract

- Trachea
- Bronchial tree
 - R/L Primary bronchus
 - Carina
 - Lobar bronchus
 - Segmental bronchus
 - Bronchioles
 - Alveoli



Regional Lymph Nodes

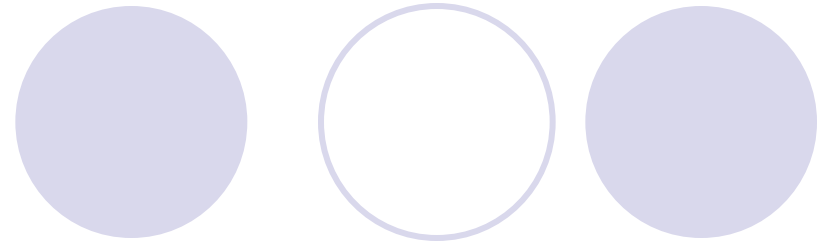
- Bronchial
- Hilar
- Intrapulmonary
- Peri/Parabronchial
- Aortic
- Carinal
- Mediastinal
- Pericardial
- Subcarinal
- Supraclavicular



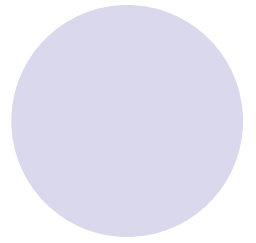
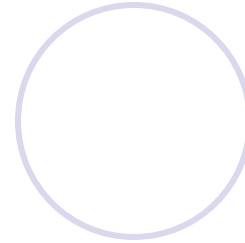
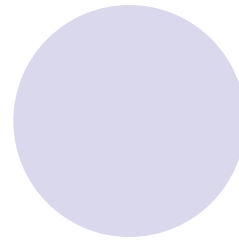
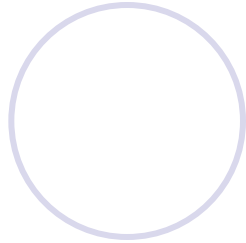
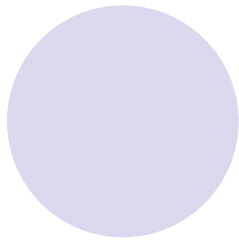
Respiratory System Malignancies

- Upper Respiratory Tract
 - Squamous cell carcinoma
- Lung
 - Small Cell (Oat Cell): comprises about 20% of all lung cancers
 - Non-small cell:
 - Adenocarcinoma- 40% of all lung cancers
 - Squamous Cell Carcinoma- 30% of all lung cancers
 - Large Cell Carcinoma- 10% of all lung cancers

Mesothelioma



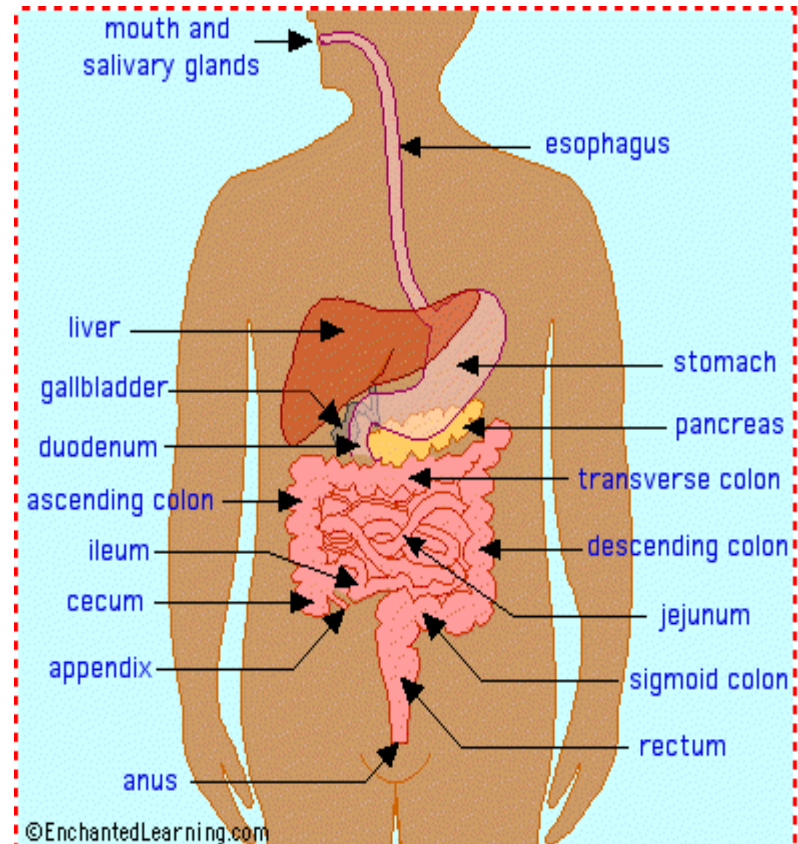
- Cancer that attacks the mesothelium
- Two types:
 - Pleura
 - Peritoneal
- Can be benign or malignant
- Very rare
- Major risk factor is asbestos exposure



Digestive System

Digestive System

- **Mouth:** beginning of digestive tract; ingests & breaks down food
- **Pharynx:** food enters after it is swallowed
- **Esophagus:** mucous lining carries food through



Digestive System

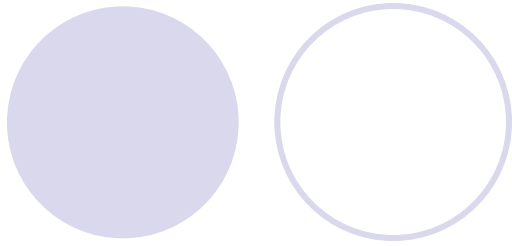


- **Stomach:** food mixes with gastric juices & forms chyme, partially digested food
- **Small intestine:** finishes digestion, absorbs nutrients, passes residue to large intestine
 - Duodenum, Jejunum, Ileum
- **Large intestine:** functions include absorption of water & electrolytes & elimination of feces
 - Colon, Rectum, Anus

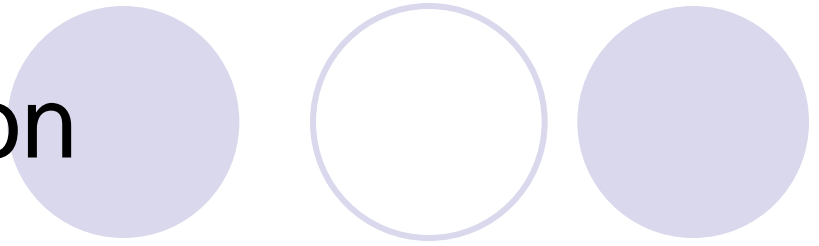


Large Intestine

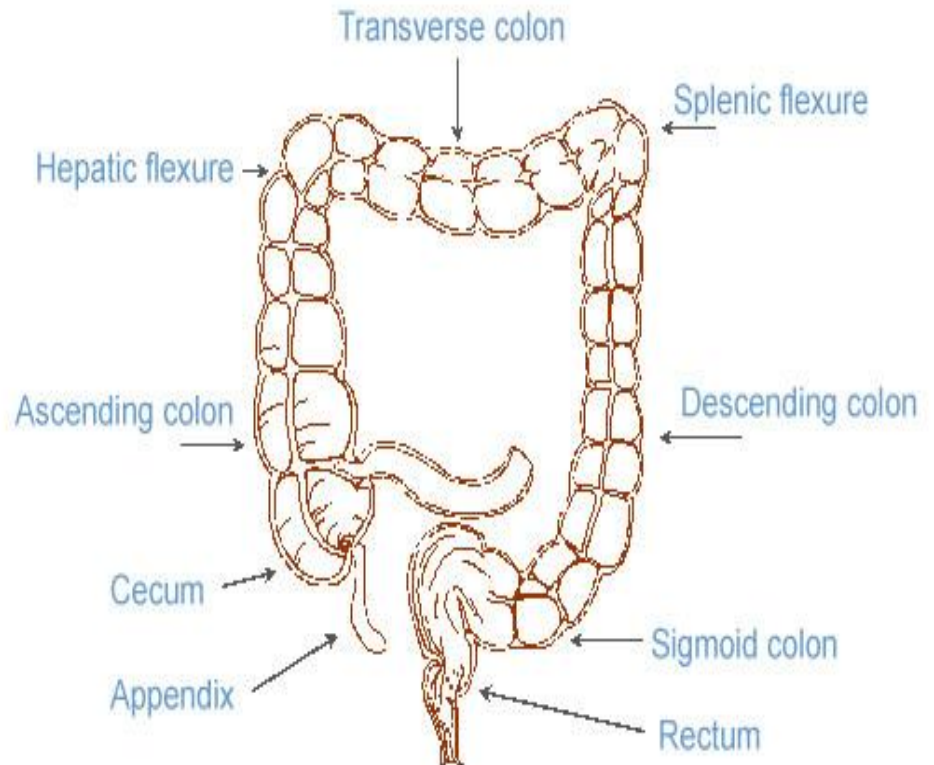
- 1.5 meters long
- Begins at distal end of small intestine and opens to the outside as the anus
- Divisions
 - Cecum
 - Colon
 - Rectum
 - Anal Canal



Colon



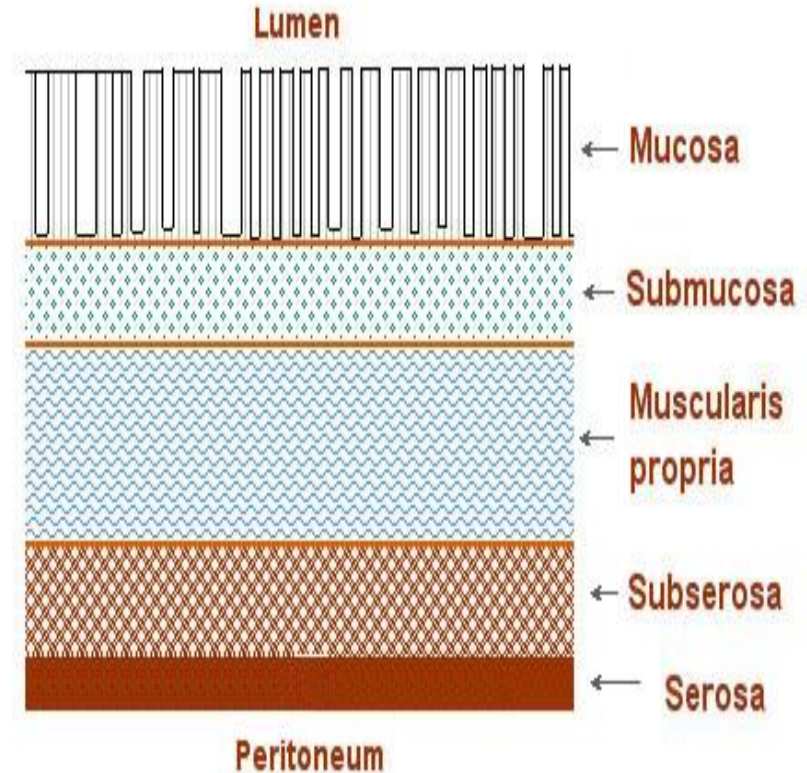
- Divisions:
 - Ascending
 - Hepatic Flexure
 - Transverse
 - Splenic Flexure
 - Descending
 - Sigmoid
- Held in place & supported by the mesentery or omentum



Colon

- Layers of Bowel Wall:

- Lumen
- Mucosa
- Surface Epithelium
- Lamina Propria
- Muscularis Mucosae
- Submucosa
- Circular layer
- Longitudinal layer
- Subserosa
- Serosa

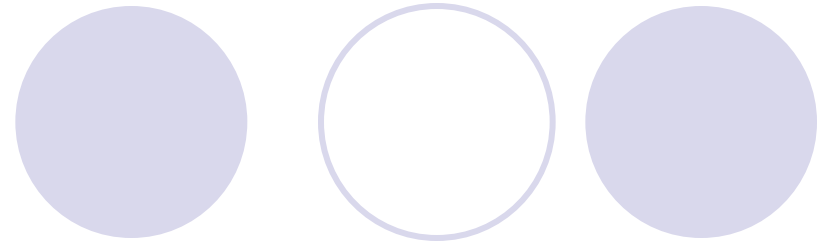


Colon Cancer



- 98% of colon cancers are adenocarcinoma
- Mucinous (colloid) adenocarcinoma
- Signet ring adenocarcinoma
- Adenocarcinoma in adenomatous polyp(s)
- Adenocarcinoma in adenomatous polyposis coli
- Adenocarcinoma in villous adenoma
- Lymphoma (many cell types)

Digestive System

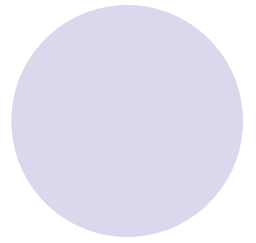
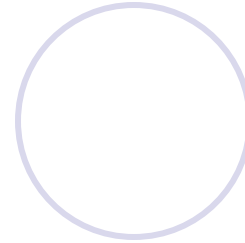
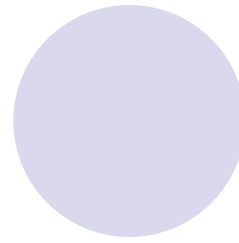
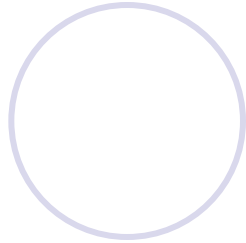
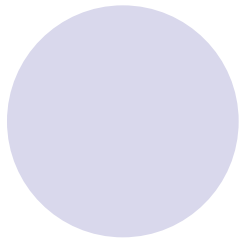


- Accessory Organs:

- Tongue
- Teeth
- Salivary glands (Parotid, Submandibular, Sublingual)
- Liver
- Gallbladder
- Pancreas

Digestive System Malignancies

- Mouth, tongue, pharynx & esophagus
 - Squamous cell carcinoma
- Stomach & small intestine
 - Adenocarcinoma
 - Lymphoma
 - Leiomyosarcoma
- Anus
 - Squamous cell carcinoma
- Liver
 - Hepatocellular carcinoma
 - Cholangiocarcinoma
 - Hepatic bile ducts

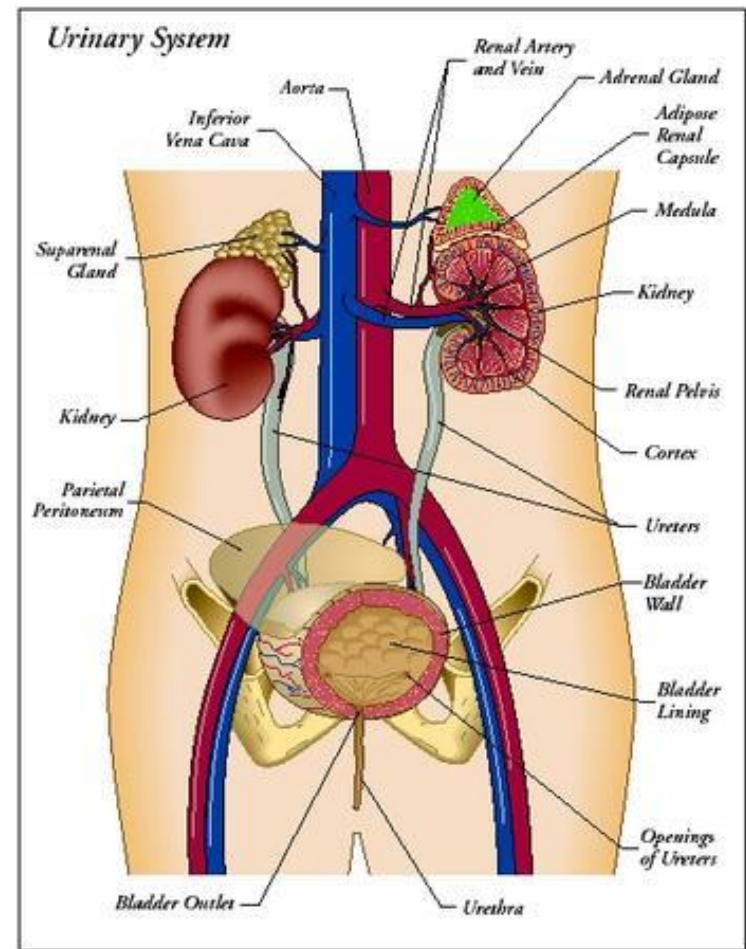


Urinary System

Urinary System

- Maintains body's volume & composition of fluids
- Controls red blood cell production
- Maintains blood pressure

Image from www.faqs.org/health/



Kidneys

- Function: filter blood, remove wastes, secrete wastes in urine
- Located retroperitoneally
- Held in place by connective tissue, renal fascia
- Surrounded by renal fat
- Renal pelvis: central region of kidney that collects urine

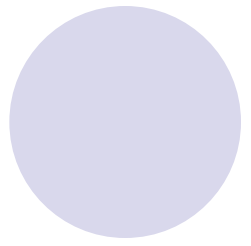
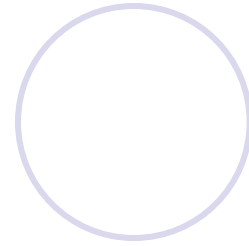
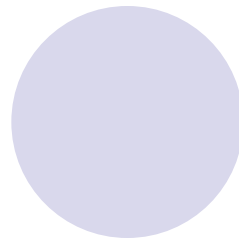
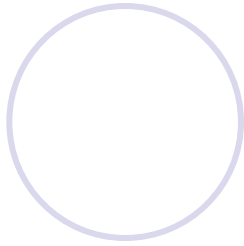
Ureters

- Carry urine from renal pelvis to bladder
- Contain 3 layered wall
 - Fibrous coat- supporting connective tissue
 - Muscular coat- smooth muscle that propels urine
 - Mucosa- inner layer of wall that secretes mucus to protect cell surface

Bladder

- Temporary storage space for urine
- Size & shape varies w/ amount of urine it collects
- Inner lining: mucous membrane
 - Rugae: fold of mucosa that allows bladder to expand as it fills
- Second layer: submucosa
- Third layer: muscularis is smooth muscle

Bladder



- Trigone: triangular area formed by 3 openings on bladder floor
 - 2 openings are from ureters
 - 3rd opening is into urethra
- Dome: top area of bladder
- Posterior wall
- Lateral wall
- Anterior wall
- Bladder neck

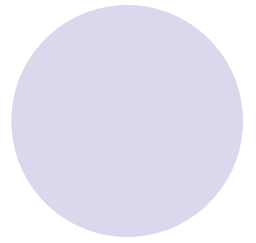
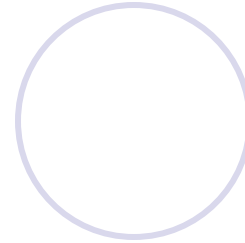
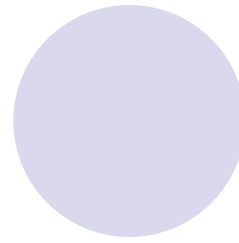
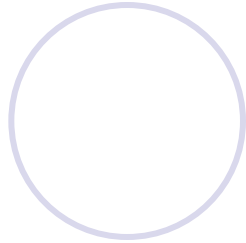
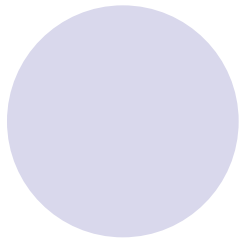
Urethra

- Final passageway for urine that conveys urine from bladder to the outside
 - Sphincters control urine flow through urethra
- In females, short tube, 3-4cm that opens to outside anterior to vaginal opening
- In males, longer tube, 20cm that transports urine & semen



Urinary System Malignancies

- Kidneys
 - Renal cell carcinoma
 - Adenocarcinoma
- Renal pelvis, ureters, bladder, urethra
 - Transitional cell carcinoma



Reproductive System



Male Reproductive System

- Testes

- Paired organ, male gonads
- Located in scrotum
- Tunica albuginea- connective tissue capsule surrounding testes
- Contains seminiferous tubules that produce semen

Male Reproductive System

- Duct system

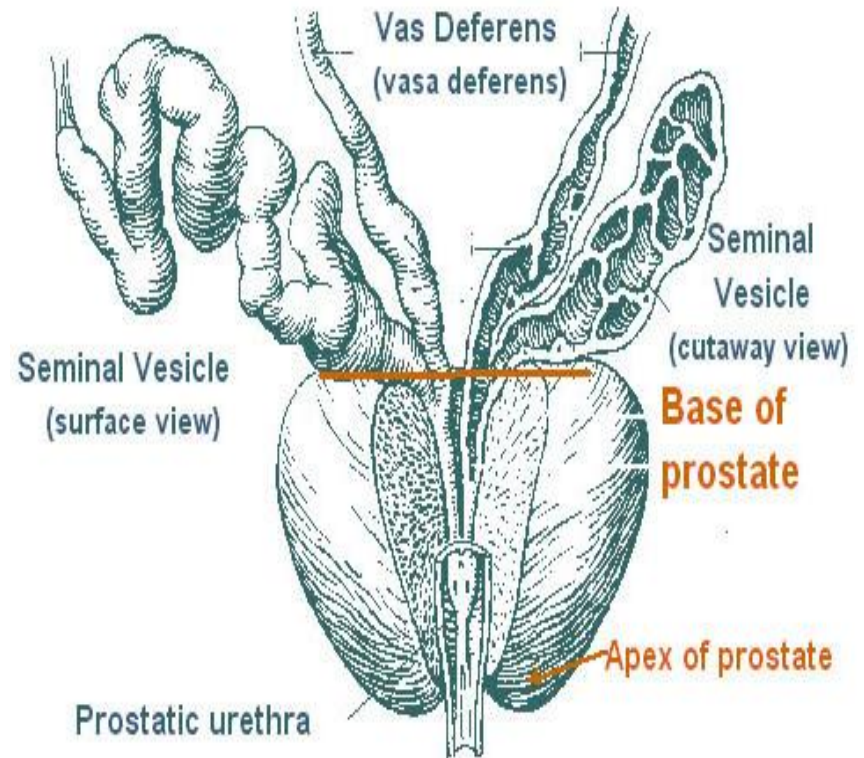
- Ductus deferens: also known as vas deferens; stores & then propels sperm
- Ejaculatory duct: passes through prostate & empties sperm into urethra
- Urethra: Passageway for sperm

- Accessory organs

- Seminal vesicles
- Bulbourethral glands
- Seminal fluid

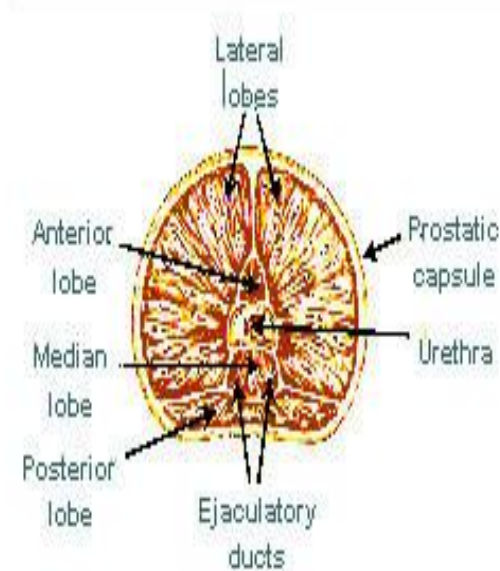
Prostate

- Divided in two different ways: zone or lobe
- Base is fused to the bladder
- Transitional zone is in the inner zone
- 4 distinct glandular regions



Prostate

- Lobes:
 - Anterior lobe (isthmus)
 - Posterior lobe
 - Lateral lobes
 - Median lobe (middle lobe)





Prostate Malignancies

- Histologies:
 - Adenocarcinoma (95% of all prostate cancers)
- Rare Histologies:
 - Sarcoma
 - Transitional cell carcinoma
 - Small cell carcinoma
 - Squamous cell carcinoma

Male Reproductive System



- Penis: male copulatory organ

- Includes:

- Root
 - Shaft
 - Glans penis

- Types of malignancies

- Epidermoid carcinoma: SCC
 - Verrucous carcinoma: rare
 - Adenocarcinoma
 - Melanoma
 - Sarcoma

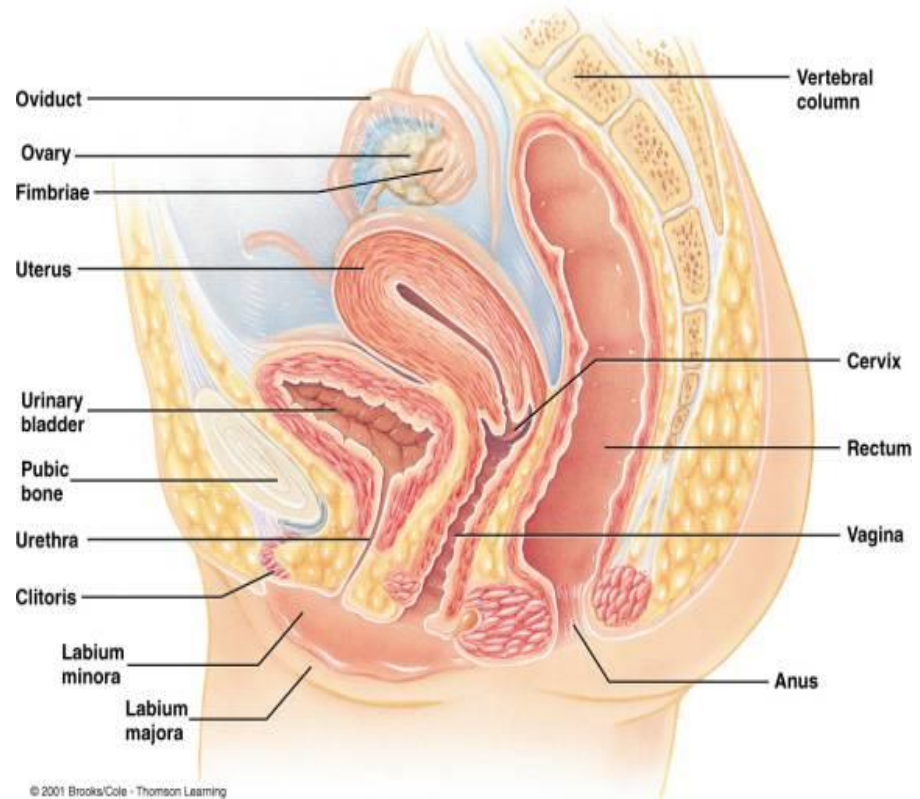
Female Reproductive System

- Ovaries:

- Paired organ
- Substance of ovaries
 - Outer cortex
 - Inner medulla
- Produce oocyte to be fertilized

- Fallopian tubes:

- Also known as oviducts
- Paired organ where oocyte travels to be fertilized



Female Reproductive System

- Uterus: muscular organ that provides environment for developing fetus
 - Corpus: body of uterus
 - Cervix: lower part of uterus
- External genitalia
 - Vulva
 - Mons pubis
 - Labia minora
 - Clitoris
 - Glands w/in vestibule

Female Reproductive Sys. Malignancies

- Uterus

- Endometrioid adenocarcinoma: 75-80%
- Papillary serous adenocarcinoma: 10%
- Clear cell adenocarcinoma: 4-5%

- Ovary

- Epithelial ovarian carcinoma: 90%
- Germ cell ovarian carcinoma: 5%
- Stromal ovarian carcinoma: 5%

Female Reproductive System

- Breast

- Composition of the Breasts:

- Accessory reproductive organs
 - Each gland is composed of 15-20 lobes
 - Each lobe contains tubular (alveolar) glands that empty into lactiferous ducts
 - Each nipple is surrounded by pigmented skin called the areola

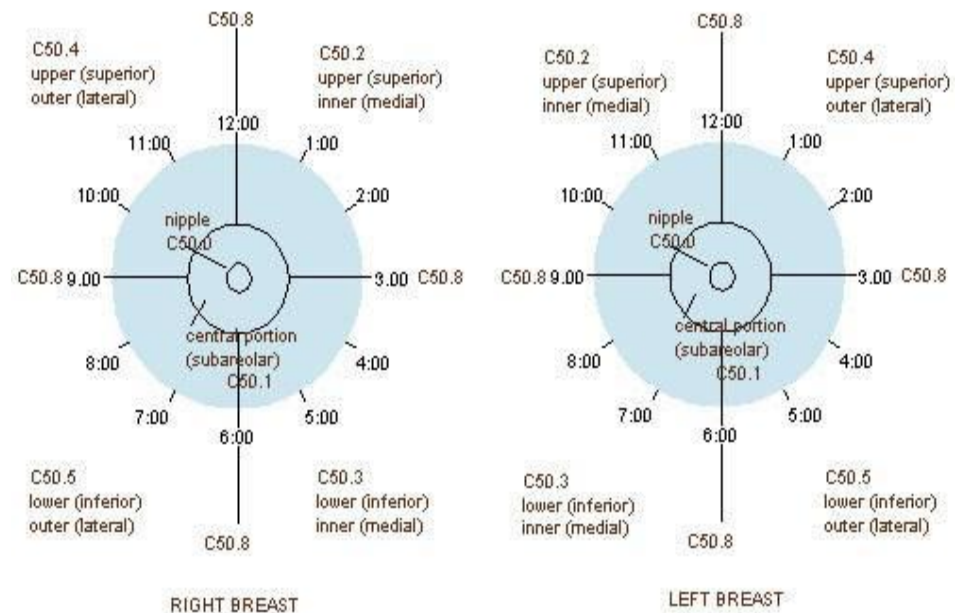
- Hormones responsible for production & ejection of milk:

- Placental lactogen
 - Estrogen
 - Progesterone
 - Prolactin
 - Oxytocin

Breast Divisions

- Nipple
- Central portion
- Upper-Inner
- Lower-Inner
- Upper-Outer
- Lower-Outer
- Axillary Tail

"Clock" Positions, Quadrants and ICD-O Codes of the Breast



Images from TNM atlas, 6th edition

Lymphatic Drainage

- Axillary Nodes
 - Level I (low axilla)
 - Level II (mid axilla)
 - Level III (apical axilla)
- Internal Mammary
 - Nodes in the intercostal spaces along the border of the sternum
- Supraclavicular
 - Located right above your collarbone, at the base of your neck

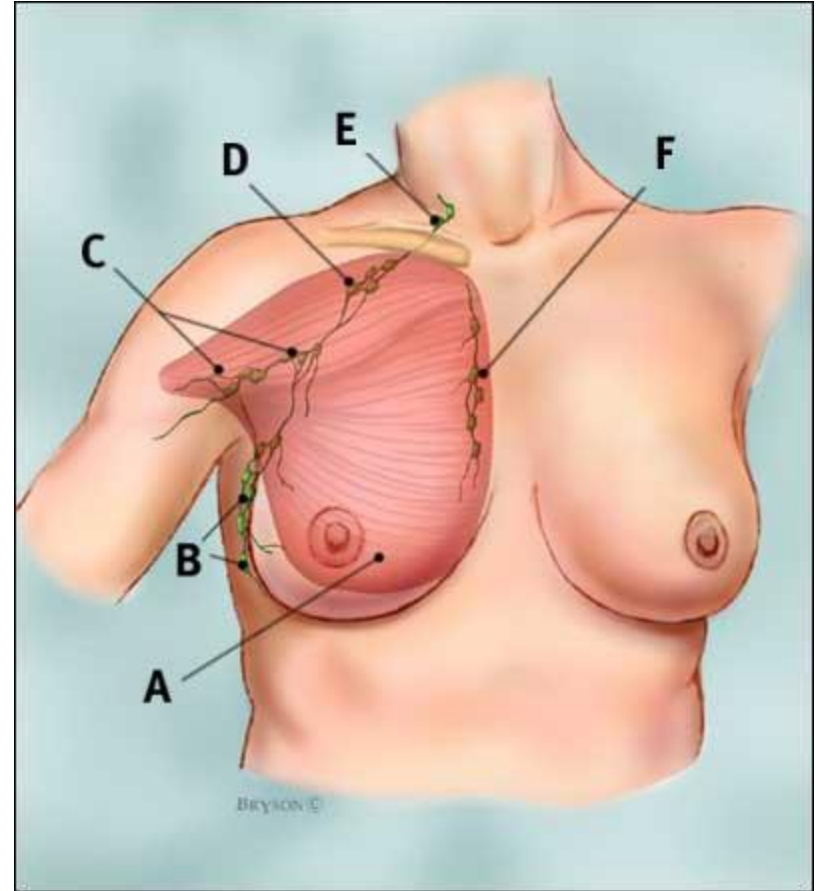
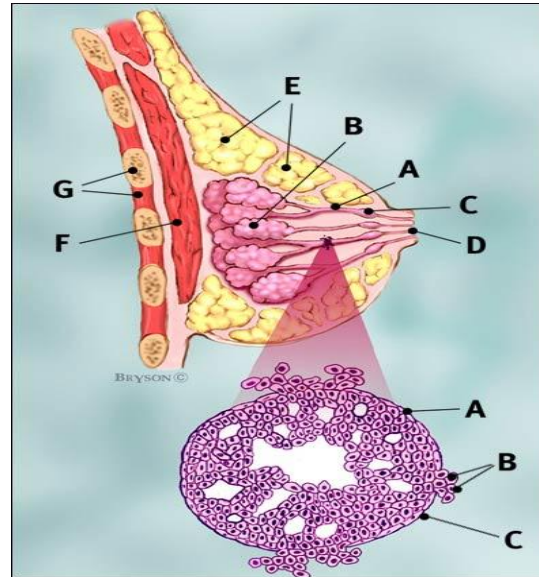


Image from www.breastcancer.org

Breast Malignancies

- Ductal Carcinoma (Invasive & In-Situ)
 - DCIS: most common kind of non-invasive breast cancer
 - Invasive: 80% of all breast cancers

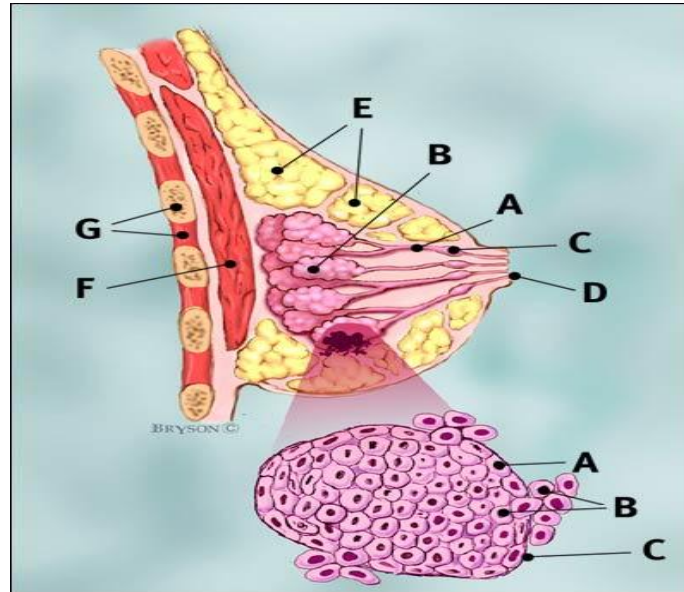
Normal breast with
invasive ductal
carcinoma (IDC) in
an enlarged cross-
section of the duct



Breast Malignancies

- Lobular Carcinoma (In-Situ & Invasive)
 - LCIS: generally considered a pre-cancerous condition
 - Invasive: about 10-15% all breast cancers

Normal breast cancer with invasive lobular carcinoma in an enlarged cross-section of the lobule.



Exercises!!!



Answer Discussion





A&P Post-Test

- Multiple Choice

- ☐ 1. C
- ☐ 2. A
- ☐ 3. D
- ☐ 4. A
- ☐ 5. B
- ☐ 6. C
- ☐ 7. D
- ☐ 8. C
- ☐ 9. B
- ☐ 10. D



A&P Post-Test

- Fill in the blank
 11. Cecum, Colon, Rectum and Anal Canal
 12. Mesentery or Omentum
 13. Urinary System
 14. Trigone
 15. Transitional Cell Carcinoma (TCC)
 16. Transitional zone
 17. Adenocarcinoma
 18. Supraclavicular
 19. Ductal Carcinoma In-Situ (DCIS)
 20. Accessory reproductive



Helpful Websites

- <http://training.seer.cancer.gov>
- www.righthealth.com
- www.healthyarkansas.com/arkcancer/arkcancer.html



Thank You!!

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